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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/676,936	10/01/2003	Vincent A. White	GP-302531	7848

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CHRISTOPHER DEVRIES
General Motors Corporation
Legal Staff, Mail Code 482-C23-B21
P.O. Box 300
Detroit, MI 48265-3000

EXAMINER

NGUYEN, TU MINH

ART UNIT	PAPER NUMBER
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3748

DATE MAILED: 10/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/676,936

Applicant(s)WHITE ET AL. **Examiner**

Tu M. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 September 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 and 9-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 and 9-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 October 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. An Applicant's Amendment filed on September 30, 2004 has been entered. Claim 8 has been canceled; claims 1, 4, 7, and 12 have been amended; and claim 17 has been added. Overall, claims 1-7 and 9-17 are pending in this application.

Drawings

2. The drawings are objected to because:

- Reference character "10" has been used to designate both "control system" and "oxygen sensor" on page 6, line 3. Corrected drawing sheets are required in reply to the Office Action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

- In Figure 3, "SULFER" should read --SULFUR--.

Correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-7 and 9-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ito et al. (U.S. Patent 5,655,363).

Re claims 1, 7, 12, and 16, as shown in Figures 1-4 and 7, Ito et al. disclose a method of controlling the air-fuel ratio in an internal combustion engine to improve catalytic converter performance and an engine control system for the engine, the system comprising:

- a fuel injector (6) for introducing fuel into the internal combustion engine;
- a controller (5) for controlling the amount of fuel injected into the internal combustion engine by the fuel injector;
- an exhaust manifold (13) coupled to the internal combustion engine;
- a three-way catalytic converter (14) coupled to the exhaust manifold; and
- an oxygen sensor (15) coupled to the catalytic converter;

wherein the controller dithers the air-fuel ratio about stoichiometry based on the oxygen sensor and introduces a fuel enrichment pulse to periodically sweep the air-fuel ratio across stoichiometry, the fuel enrichment pulse introduction based upon the rate of sulfur reaction with

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the three-way catalytic converter (see steps S83-S85 in Figure 4, Figure 7, lines 50-56 of column 12, and line 52 of column 10 to line 5 of column 11).

Ito et al., however, fail to disclose that instead of the air-fuel ratio, the controller dithers the equivalence ratio about stoichiometry.

Ito et al. disclose the claimed invention except for utilizing equivalence ratio as an indicator of an exhaust gas property. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use equivalence ratio in Ito et al., since the examiner takes Official Notice of the equivalence of "air-fuel ratio" and "equivalence ratio" for their use in the exhaust gas treatment art (i.e., equivalence ratio is simply the ratio of stoichiometric air-fuel ratio (i.e., 14.7) and an air-fuel ratio of an air fuel mixture), and the selection of any of these known equivalents would be within the level of ordinary skill in the art.

Re claims 2 and 3, the method of Ito et al. discloses the invention as cited above, however, fails to disclose that the step of varying an equivalence ratio setpoint between a rich and a lean state characterized as a periodic function comprises varying the equivalence ratio between 0.9 and 1.1; and that the magnitude of the fuel enrichment pulse at least enriches the equivalence ratio by 0.1.

Ito et al. disclose the claimed invention except for specifying an optimum range of equivalence ratio setpoint between 0.9 and 1.1 and for specifying an optimum range of a fuel enrichment pulse that enriches the equivalence ratio by a magnitude of at least 0.1. It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide specific optimum ranges of equivalence ratio setpoint and of fuel enrichment pulse magnitude, since it has been held that where the general conditions of a claim are disclosed in the

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prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Re claim 4, in the method of Ito et al., the fuel enrichment pulse is added periodically based on the rate of sulfur poisoning of the three-way catalytic converter (step S85 is performed only when the answer in step S84 is YES).

Re claims 5 and 9, the method of Ito et al. further comprises determining the equivalence ratio of the internal combustion engine using an oxygen sensor (15).

Re claims 6, 10, and 11, in the method of Ito et al., the oxygen sensor (15) generates a discrete analog signal.

Re claims 13-15, the system of Ito et al. discloses the invention as cited above, however, fails to disclose that the internal combustion engine is at least one of an overhead valve engine, an overhead cam engine, and a rotary engine.

Some of the internal combustion engines for vehicles are designed to be of the rotary type to improve engine performance because of the absence of end-of-excursion power loss as the movable parts in rotary engines do not reverse direction. Other engines are configured with overhead cam or valve to achieve a compact engine and to improve volumetric efficiency. Therefore, such disclosures by Ito et al. are notoriously well known in the art so as to be proper for official notice. It would have been obvious to one having ordinary skill in the art at the time of the invention was made, to have configured the engine of Ito et al. to be of at least one of an overhead valve engine, an overhead cam engine, and a rotary engine, since the use thereof is routinely utilized by most workers in the art of internal combustion engines for vehicles.

5. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ito et al. as applied to claim 12 above, in view of Andersen et al. (U.S. Patent 6,634,169).

The system of Ito et al. discloses the invention as cited above, however, fails to disclose that the sulfur is removed from cerium molecules in the catalytic converter.

As shown in Figure 1, Andersen et al. teach a method and a system for maintaining efficiency of a three-way catalyst (TWC) (6) by performing periodic enrichment of the air-fuel ratio and adding secondary air to the exhaust gas so that oxidation of the unburned fuel can occur over the TWC thereby raising the TWC temperature to a sufficiently high temperature to reduce sulfur poisoning of the TWC. As indicated on lines 9-35 of column 1 and claimed in claim 2, Andersen et al. further teach that it is conventional in the art to utilize a TWC containing cerium compounds; and that sulfur purge is necessary to desorb the SO_x adsorbed by the cerium compounds. It would have been obvious to one having ordinary skill in the art at the time of the invention was made, to have utilized the TWC taught by Andersen et al. in the system of Ito et al., since the use thereof would have been routinely practiced by those with ordinary skill in the art.

Response to Arguments

6. Applicant's arguments with respect to the references applied in the previous Office Action have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office Action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Prior Art

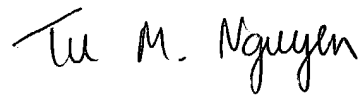
8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure and consists of one patent: Ito et al. (U.S. Patent 5,724,808) further disclose a state of the art.

Communication

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Tu Nguyen whose telephone number is (703) 308-2833 or (571) 272-4862 to be effective on November 22, 2004.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Thomas E. Denion, can be reached on (703) 308-2623 or (571) 272-4859 to be effective on November 22, 2004. The fax phone number for this group is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-1148.



TMN

October 10, 2004

Tu M. Nguyen

Patent Examiner

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